(19) Europäisches Patentamt
European Patent Office
Office européen des brevets

(11) EP 1 328 096 A2

# (12) EUROPEAN PATENT APPLICATION

(43) Date of publication:
**16.07.2003 Bulletin 2003/29**

(51) Int Cl.[7]: **H04L 12/56**, H04L 29/06

(21) Application number: **03250136.3**

(22) Date of filing: **09.01.2003**

(84) Designated Contracting States:
**AT BE BG CH CY CZ DE DK EE ES FI FR GB GR HU IE IT LI LU MC NL PT SE SI SK TR**
Designated Extension States:
**AL LT LV MK RO**

(30) Priority: **10.01.2002 KR 2002001563**

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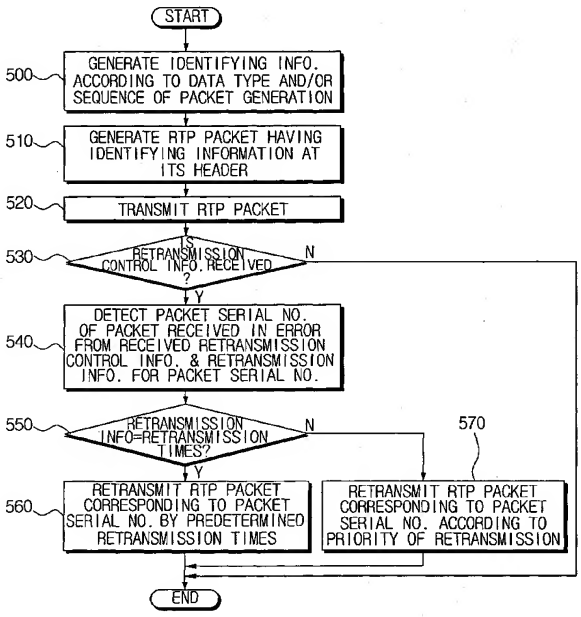
## (54) Multimedia data packet communication with data type identifiers

(57) A data transmitter (40) comprises means (42, 44) for transmitting a data packet containing identifier information comprising a kind of data, a sequence of data, and/or a packet generating sequence. A receiver (60) includes means (66) for extracting a packet number and the identifier information for an error-receipt occurring data packet based upon the identifier information recorded in a header of the packet, means (67) for generating retransmission control information, such as retransmission times and priority, based on the extracted packet number and the identifier information and transmitting the retransmission control information to the transmitter of the packet. The retransmission of the error-occurring data packets is in accordance with the retransmission control information received by the data transmitter (40). The number of retransmissions and the retransmission priority can be varied according to characteristics of the transmitted data, so that retransmissions is suitable for the characteristics of the data and to more stably receive the data that is more influential to the restoration of the data.

FIG.5

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## Description

**[0001]** The present invention relates to a method of data transmission for multimedia data, the method comprising generating data packets containing multimedia data to be transmitted and transmitting said packets to a remote station using a connectionless protocol, and to a data transmission apparatus for transmitting multimedia data, the apparatus comprising means for generating data packets containing multimedia data to be transmitted and means for transmitting said packets to a remote station using a connectionless protocol.

**[0002]** Data that needs to be transmitted in real-time, such as moving image data, audio data and the like, is transmitted using the Real-time Transport Protocol (RTP) for transmitting real-time application data. However, the RTP protocol standard does not deal with content relating to resource reservation, and in particular, the RTP protocol standard does not provide various functions, such as timely data transmission, guarantee of quality of service and prevention of transmission in erroneous order since it focuses on real-time data transmission. An RTP packet is transmitted using an underlying user datagram protocol.

**[0003]** Figure 1 is a format diagram of an RTP packet, in which an RTP packet header has a fixed size and is followed by particular information and data. The header of the RTP packet includes various fields, including a version field V, a flag P indicating whether the packet contains padding octets, a flag X indicating whether there is a header extension, a contributing source count field CC indicating the number of contributing-sources, a flag M for use as a marker for significant events such as frame boundaries, a payload type field PT indicating the format of the payload according to a profile defined in RFC1890, a sequence number field, a timestamp field indicating the point in time when the first octet is sampled, a synchronization source identifier field SSRC indicating the synchronisation source and a contributing sources field CSRC which identifies of the data sources, such as cameras, microphones, etc. If the RTP packet is mixed in an intermediate system, a VSRC field indicates the identifiers capable of identifying the sources.

**[0004]** Control information is transmitted using the real time transport control protocol. For example, in a real-time electronic conference system, RTCP exchanges QoS information, such as the number of packets lost between conference participations, jitter intervals, delay time between preceding and following packets and the like, and thereby allows an application to evaluate the actual QoS and provide adaptive encoding. In addition, to accommodate a large number of participants, the RTCP involves calculating transmission rates for the packets and transmitting minimum session control information designating a participant's ID. Since the source identifiers of data have to be changed to avoid two sources having the same identifier, the RTCP transfers a permanent transport identifier called the Canonical Name. Periodically, the RTCP has to transmit control packets to all participants. To control the participants, several types of RTCP packets have been defined as follows:

(a) SR is used by senders to inform other participants of statistical information on the senders' transmission and/or reception.
(b) RR is used by participants, but not by senders, to generate statistical information on their transmission and/or reception.
(c) SDES is used to describe a name of the source containing CNAME.
(d) BYE is used to escape out of an RTP session.
(e) APP is used to designate a particular function of a new application or a new function.

**[0005]** These RTCP packets are sent in a complex packet format containing at least two packets.

**[0006]** Figure 2 is a format diagram of a plurality of RTCP packets encapsulated in a user datagram protocol (UDP) packet.

**[0007]** Referring to Figure 2, the RTCP packet is followed by a field having a variable length in accordance with a fixed header field and a packet format. SR packet 210, SDES packet 220 and BYE packet 230 are encapsulated in the UDP packet 200.

**[0008]** The RTP packets described with reference to Figures 1 and 2 is transmitted using cable or wireless communication. The situation that the receiver cannot receive properly the whole or a portion of the packet can happen, due to the loss of a portion of a packet, or damage to the data by noise or the like during transmission of an RTP packet,. The RTP packet is encapsulated and transmitted in the UDP packet, which does not guarantee delivery. In addition, it is uncertain whether the data packet from the receiver is received in the correct order. Therefore, in the UDP environment, the receiver has to compensate for the data damage, and also, the receiver has to have a packet duplicating function and a packet rearranging function.

**[0009]** Under the general transmitting environment, the transmitted signal is much affected by the noise, has a high possibility of being damaged by a burst occurring in a specific section of the transmission path, and can be interfered with by other signals. Furthermore, data damage or loss is more serious in wireless sections. A data receipt error is inevitably generated, but UDP is a protocol which does not guarantee the reliable transmission of the data. Therefore, in the case of transmitting/receiving data in UDP packets, the retransmission of the receipt error-occurring data should be guaranteed.

**[0010]** Figure 3 is a signalling diagram of a data retransmission process in a conventional data transmission system.

**[0011]** Referring to Figure 3, in a conventional data transmission system 30, if a receiver 32 requests a data transmission, a sender 34 transmits packets to a receiv-

er 32. The receiver 32 checks for errors in the received packets, and transmits the serial numbers of the error packets to request retransmission. The sender 34 retransmits the packets corresponding to the received packet numbers at predetermined times.

**[0012]** The typical retransmission of a lost packet employs a retransmission method standardized for all data, irrespective of the transmission medium and available bandwidth. Specifically, the number of retransmission times is pre-set, and an error packet is retransmitted within a range of the pre-set number of retransmission times. However, this method does not take into consideration characteristics of multimedia data.

**[0013]** There is also the case in which the data requested to be transmitted does not always have the same influence on restoration of the data. In particular, in moving image data encoded in an MPEG format using intra-image and inter-image coding, restoration quality depends on the respective MPEG images. In addition, the same kind of image may have a different influence on the restoration of the data in accordance with the time-related sequence. Accordingly, there is a need to control retransmission to reflect the characteristics of the data.

**[0014]** A method according to the present invention is characterised in that the generation of data packets includes incorporating a data type identifier in the headers of the data packets, the data type identifier being established in dependence on the type of the multimedia to which said multimedia data relates.

**[0015]** According to the present invention, there is also a method of receiving data transmitted by a method according to the present invention, the method comprising detecting lost or corrupted packets, determining the data type identifiers for the lost or corrupted packets, and requesting retransmission of lost or corrupted packets, wherein one or more parameters for the requested retransmissions is set in dependence on the determined data type identifiers.

**[0016]** Preferably, said parameter or parameters are priority and/or retransmission times.

**[0017]** A data transmission apparatus according to the present invention is characterised in that the means for generating data packets is configured to incorporate a data type identifier in the headers of the data packets, the data type identifier being established in dependence on the type of the multimedia to which said multimedia data relates.

**[0018]** According to the present invention, there is also provided an apparatus for receiving data transmitted by a method according to the present invention, the apparatus comprising means (65) detecting lost or corrupted packets, means (66) for determining the data type identifiers for the lost or corrupted packets, and means (67) for requesting retransmission of lost or corrupted packets, wherein one or more parameters for the requested retransmissions is set by the means (67) for requesting retransmission of lost or corrupted packets in dependence on the determined data type identifiers.

**[0019]** Preferably, said parameter or parameters are priority and/or retransmission times.

**[0020]** Other preferred and optional features of the present invention are set out in claims 7 to 63 appended hereto.

**[0021]** An embodiment of the present invention will now be described, by way of example, with reference to Figures 4 to 9 of the accompanying drawings, in which:

Figure 1 shows the format of an RTP packet;
Figure 2 illustrates a plurality of RTCP packets encapsulated by an UDP packet;
Figure 3 is a signalling diagram of a data retransmission process in a conventional data transmitting system;
Figure 4 is a block diagram of a data transmission system according to the present invention;
Figure 5 is a flowchart of a data transmission method using the data transmission system shown in Figure 4;
Figure 6 is a block diagram of a data receiving system according to the present invention;
Figure 7 is a flowchart of a data receiving method using the data receiving system shown in Figure 6;
Figure 8 is a block diagram of a data transmission/reception system based upon the data transmission and receiving systems shown in Figures 4 and 6; and
Figure 9 is a flowchart of a data transmission/reception method using the data transmission/reception system shown in Figure 8.

**[0022]** Referring to Figure 4, a data transmitting system 40 comprises a packet generating section 42, a transmitting section 44, a receiving section 45, a storing section 46, and a retransmitting section 48.

**[0023]** The packet generating section 42 generates a data packet containing identifier information according to the kind of data, the sequence of data, and/or a packet generation sequence. According to an aspect of the invention, the packet generating section 42 generates the data packet according to a real-time transport protocol. The operation of the packet generating section 42 will now be described with an example in which the generated data is moving image data coded in an MPEG format.

**[0024]** MPEG format image data comprises intra-image coded frames encoded with no reference to other image frames and inter-image coded frames encoded with reference to a preceding and/or a following image frame of the image data being encoded. In addition, the inter-image coded frames are ordered according to a time line. In an MPEG image, because only intra-image coded frames only can be restored without reference to other image frames, the intra-image coded frames are provided to enable random access to the video stream and are inserted at constant intervals. Accordingly, in

the transmission of the MPEG image data, the intra-image coded frames are more important than the inter-image coded frames. Also, an earlier inter-image coded frame is more important than a later one.

**[0025]** Accordingly, the packet generating section 42 detects the type of the data, i.e. detects whether the data is an intra-image coded frame or the inter-image coded frame and records the data type information in the header of the RTP packet. The data type information may be recorded in a reserved field of the RTP header for which a use is not specified in the relevant RFCs, or a field may be added to the RTP header.

**[0026]** In addition, the packet generating section 42 detects/maintains a packet generating sequence for the data, i.e. the sequence of a divided frame to record as the packet generating sequence information in the header of the RTP packet. In particular, because of transmission problems, such as low transmission bandwidth or large transmission delay, in real-time multimedia transmission, one packet is typically divided into a plurality of packets, and then the divided packets are transmitted. Generally, each RTP packet is 256 bytes, 512 bytes or the like. Accordingly, the packet generating section 42 also records as part of the identifier information the data sequence and the packet generation sequence of the RTP packet, as follows.

**[0027]** For example, a first intra-image coded frame I1 is divided into five RTP packets and then the five RTP packets are transmitted. In this example, the packet generating section 42 generates identifier information, such as I1a, I1b, I1c, I1d, He, for the intra-image coded frame I1. The identifier information I1a, I1b, I1c, I1d and I1e is added to the five RTP packet headers for the intra-image coded frame I1. In the identifier information, I indicates a packet generated from the intra-image coded frame, 1 indicates the first intra-image coded frame, and 'a' to 'e' indicate the packet generation sequence position of an RTP packet.

**[0028]** The packet generating section 42 generates the RTP packets for the intra-image coded frames and the inter-image coded frames, to which the identifier information generated by the aforementioned method is added. Although a specific type of identifier information has been described hereinbefore, the identifier information may be generated in various formats. Specifically, the identifier information may be generated in any format capable of indicating the type and sequence of the data and the packet order.

**[0029]** In the case that the RTP packet is transmitted over a wireless communication link, according to an aspect of the invention, the data transmitting system further comprises a packet transforming section for transforming RTP packets into radio link protocol packets. This is because, typically, transmission between a mobile station and a base station is achieved using an RLP unit that is a transmission unit of a radio link layer.

**[0030]** The RTP packets generated by the packet generating section 42 are stored in the storing section 46. Upon a retransmission request from a receiving system, the appropriate RTP packet, stored in the storing section 46, is read and retransmitted to the receiver system.

**[0031]** The packet transmitting section 44 transmits the RTP packets, and the receiving section 45 receives retransmission control information. In a wireless communication environment, the RTP data packeted by the RLP is transmitted. The retransmission control information is received in a real-time transport control protocol packet.

**[0032]** The retransmitting section 48 retransmits an a lost or corrupted data packet, according to received retransmission control information. The retransmission control information comprises the packet number of the lost or corrupted data packet, and a number of retransmission times. Typical reception errors are loss of an RTP packet and receipt of a corrupted RTP packet. The retransmission control information is information, such as packet number, number of retransmitting times, retransmission priority and the like, set by the receiving system, based at least on the identifier information in received data packets. After the retransmitting section 48 determines the packet number of the lost or corrupted RTP packet from the retransmission control information, the retransmitting section retransmits the RTP packet requested to be retransmitted, according to the number of retransmission times set for the respective packet number.

**[0033]** Referring to Figure 5, at operation 500, the packet generating section 42 generates the identifier information comprising the data type and sequence, and/or a packet generation sequence for the data. At operation 510, the packet generating section 42 adds the generated identifier information to the RTP packet header to generate the RTP packet. At operation 520, the generated RTP packet is transmitted by the transmitting section 44 to the receiving system.

**[0034]** At operation 530, after transmission of the generated RTP packet, if the retransmitting section 48 receives retransmission control information through the receiving section 45, at operation 540, the retransmitting section 48 determines the packet number and retransmission information for the lost or corrupted packet from the received retransmission control information. The retransmission information comprises a number of retransmission times, a retransmission priority or the like.

**[0035]** At operation 550, the retransmitting section 48 determines whether the retransmission information specifies a number of retransmission times. If, at operation 550, the retransmission information specifies the number of retransmission times, at operation 560, the retransmitting section 48 retransmits the lost or corrupted RTP packet according to the number of retransmission times set for it. In the case that, at operation 550, the retransmission information specifies a retransmission priority, at operation 570, the retransmitting section 48 retransmits an RTP packet corresponding to the

packet number according to the specified retransmission priority.

**[0036]** Referring to Figure 6, a data receiving system 60 comprises a communication section 62, a retransmission control section 64 and a packet restoring section 68. The communication section 62 receives an RTP packet from the transmitting system 40, and transmits retransmission control information. If the restoring section 68 receives an RTP packet, which may be a retransmitted packet, with no errors, the restoring section 68 extracts the data from the RTP packet to restore the MPEG data.

**[0037]** Typically, if an RTP packet is corrupted, the header will not be corrupted and the retransmission control section 64 extracts the identifier information from the uncorrupted header of the corrupted RTP packet and generates retransmission control information according to the extracted identifier information. Otherwise, in the cases of lost RTP packets, including RTP packets with corrupted headers, the identifying section 65 can determine the packet number and identifier information for lost packet based upon the sequence number field in the RTP header and/or identifier information, of other related RTP packets which have not been lost.

**[0038]** In particular, the retransmission control section 64 comprises an identifying section 65, an identifier information extracting section 66 and a retransmission control information generating section 67. The identifying section 65 checks for errors in received RTP packets. Typical receiving errors are non-receipt of an RTP packet, and the receipt of an RTP packet with lost bits. In the case that there are no receiving errors, the identifying section 65 provides the received RTP packet to the restoring unit 68. The identifying section 65 detects packet numbers for corrupted packets based upon the identifier information recorded in the normally received headers of the corrupted RTP packet. In case of a lost RTP packets, the identifying section 65 determines their packet numbers and identifying information based upon the sequence number field and/or identifier information recorded in the headers of other RTP packets which have been received normally.

**[0039]** In the case that the header of a corrupted RTP packet has been received normally, the identifier information extracting section 66 extracts the identifier information of the received corrupted RTP packet. Otherwise, in case of a lost RTP packet, the identifier information extracting section 66 extracts the identifier information from the RTP packet used by the identifying section 65 to determine the RTP packet number or uses other predetermined identifier information taking into consideration characteristics of the data. The identifier information is the information generated at the transmitting system 40 based on a kind of data, a sequence of data, and/or a packet generation sequence.

**[0040]** The retransmission control information generating section 67 generates the retransmission control information comprising the packet number of the lost or corrupted data packet and a number of retransmission times according to the extracted identifier information. According to an aspect of the invention, the retransmission control information can comprise the packet number of the data packet and/or a retransmission priority set according to the extracted identifier information designating a magnitude of the received error-occurring RTP packet. The generated retransmission control information is transmitted to the data transmitting system 40 through the communication section 62.

**[0041]** If the data receiving system 60 extracts both the packet number and the identifier information of the received error-occurring RTP packet, by using only the identifier information recorded in the header of the RTP packets, the functions of the identifying section 65 and the identifier information extracting section 66 may be combined.

**[0042]** Referring to Figure 7, at operation 700, when RTP packets are received through the communication section 62, the identifying section 65 checks the packet numbers of the packet based on the identifier information recorded in normally-received headers of the RTP packet. As described above, the identifying section 65 may, for example, confirm the packet number of the packet based upon the packet generating sequence number recorded in a sequence number field of the RTP packet header which has been normally received.

**[0043]** If it is determined at operation 700 that a receiving error has occurred, at operation 710 the identifier information extracting section 66 extracts the identifier information of the received corrupted RTP packet, based on the identifier information recorded in its normally-received header. If it is determined at operation 700 that an RTP packet has been received normally, at operation 705, the MPEG data is restored via the restoring section 68.

**[0044]** At operation 720, the retransmission control information generating section 67 generates the retransmission control information comprising the packet number of the received error-occurring data packet and a number of retransmission times according to the extracted identifier information. Alternatively, the retransmission control information can comprise the packet number of the data packet and/or a retransmission priority set according to the identifier information. At operation 730, the generated retransmission control information is transmitted to the data transmitting system 40 through the communication section 62.

**[0045]** Referring to Figures 8 and 9, the data transmission/reception system 80 comprises the data transmitting section 40 and the data receiving section 60.

**[0046]** At operation 900, the data transmitter 40 transmits the RTP packet containing identifier information for the data. When the data receiver 60 receives the RTP packet, in case of error, at operation 910, the receiver 60 extracts the identifier information from the received RTP packet and transmits retransmission control information using the RTCP standard to the transmitter 40.

When the transmitter 40 receives the retransmission control information from the receiver 60, at operation 920, the transmitter 40 retransmits the error-occurring RTP packet according to the received retransmission control information.

**[0047]** Although the above example data communication methods are via cable, the present invention is not limited to wire data systems, and may be applied to wireless communication systems. Furthermore, the data transmitting method and the data receiving method according to the present invention can also be applied using protocols other than RTP. The processes of the invention to control retransmissions responsive to data characteristics of lost/damaged data can be embodied in software and/or hardware, for example, as part of the networked data transmitter 40 and the data receiver 60, using known techniques.

**[0048]** Further, according to the invention, retransmission control is based upon a number of retransmissions and retransmission priority. For example, regarding data packets containing intra-image coded frames, the number of retransmission times can be set to three, while for inter-image coded frames, the number of retransmission times can be set to two. Specifically, the number of retransmissions can be variable or dynamic depending on characteristics of the data, for example, taking into consideration restoration significance of the error-occurring frame. Furthermore, in a case that the number of retransmission times has an affect on a delay time so that the delay between the terminals becomes long, if the transmitter 40 receives a retransmission request of an intra-image, a continuously overlapped packet may be transmitted in succession, such as 2 times and 3 times, thereby reducing the probability of losing the packet. Further, retransmission priorities of image frames can be set to depend upon image frame characteristics.

**[0049]** According to the data transmitting/receiving system and method according to the present invention, the number of retransmission times and the retransmission priority are varied according to the characteristic of the transmitted data, so that retransmission is suitable for the characteristics of the data and to more stably receive the data that is more influential to restorationof the data. In particular, in a case that the data is transmitted by the RTP packet, the present invention can stream the image so that it is effectively decoded during restoration of the data at a precedence layer of the application program.

## Claims

1. A method of data transmission for multimedia data, the method comprising generating data packets containing multimedia data to be transmitted and transmitting said packets to a remote station using a connectionless protocol, **characterised in that** the generation of data packets includes incorporating a data type identifier in the headers of the data packets, the data type identifier being established in dependence on the type of the multimedia to which said multimedia data relates.

2. A method of receiving data transmitted by a method according to claim 1, the method comprising detecting lost or corrupted packets, determining the data type identifiers for the lost or corrupted packets, and requesting retransmission of lost or corrupted packets, wherein one or more parameters for the requested retransmissions is set in dependence on the determined data type identifiers.

3. A method according to claim 2, wherein said parameter or parameters are priority and/or retransmission times.

4. A data transmission apparatus for transmitting multimedia data, the apparatus comprising means (42) for generating data packets containing multimedia data to be transmitted and means (44) for transmitting said packets to a remote station using a connectionless protocol, **characterised in that** the means for generating data packets is configured to incorporate a data type identifier in the headers of the data packets, the data type identifier being established in dependence on the type of the multimedia to which said multimedia data relates.

5. An apparatus for receiving data transmitted by a method according to claim 1, the apparatus comprising means (65) detecting lost or corrupted packets, means (66) for determining the data type identifiers for the lost or corrupted packets, and means (67) for requesting retransmission of lost or corrupted packets, wherein one or more parameters for the requested retransmissions is set by the means (67) for requesting retransmission of lost or corrupted packets in dependence on the determined data type identifiers.

6. An apparatus according to claim 5, wherein said parameter or parameters are priority and/or retransmission times.

7. A data transmitting system comprising:

   a packet generator generating a data packet containing identifier information according to a kind of data, a sequence of data, and/or a packet generating sequence;
   a packet transmitter transmitting the data packet containing the identifier information;
   a receiver receiving retransmission control information, which are based upon the identifier information, for an error-occurring data packet;

and
a retransmitter retransmitting the error-occurring data packet according to the retransmission control information.

8. The data transmitting system as claimed in claim 7, wherein the packet generator adds the identifier information to a header of the data packet.

9. The data transmitting system as claimed in claim 7, wherein the data is any one of intra image and inter image.

10. The data transmitting system as claimed in claim 9, wherein the packet generator adds the identifier information to the intra image, the identifier information having a higher priority for the intra image than a priority of the inter image.

11. The data transmitting system as claimed in claim 7, wherein the retransmission control information comprises a packet number of the error-occurring data packet, and a number of retransmission times.

12. The data transmitting system as claimed in claim 11, wherein the retransmitter retransmits a data packet corresponding to the packet number according to the number of retransmission times set for the packet number.

13. The data transmitting system as claimed in claim 7, wherein the retransmission control information comprises a packet number of the error-occurring data packet, and a retransmission priority.

14. The data transmitting system as claimed in claim 11, wherein the retransmitter retransmits a data packet corresponding to the packet number according to the retransmission priority set for each data packet.

15. The data transmitting system as claimed in claim 7, wherein the data packet is transmitted by a real-time transport protocol.

16. A data transmitting method comprising :

generating a data packet containing identifier information according to a kind of data, a sequence of data, and/or a packet generating sequence; and
transmitting the data packet containing the identifier information.

17. The data transmitting method as claimed in claim 16, wherein the identifier information is added to a header of the data packet.

18. The data transmitting method as claimed in claim 16, wherein the data is any one of intra image and inter image.

19. The data transmitting method as claimed in claim 18, wherein the data packet is generated by adding the identifier information to the intra image, the identifier information having a higher priority for the intra image than a priority of the inter image.

20. The data transmitting method as claimed in claim 7, further comprising

receiving retransmission control information on an error-occurring data packet; and
retransmitting the error-occurring data packet according to the retransmission control information.

21. The data transmitting method as claimed in claim 20, wherein the retransmission control information comprises a packet number of the error-occurring data packet, and a number of retransmission times.

22. The data transmitting method as claimed in claim 21, wherein a data packet corresponding to the packet number is retransmitted according to the number of retransmission times set for the packet number.

23. The data transmitting method as claimed in claim 20, wherein the retransmission control information comprises a packet number of the error-occurring data packet, and a retransmission priority.

24. The data transmitting method as claimed in claim 23, wherein a data packet corresponding to the packet number is retransmitted according to the retransmission priority set for each data packet.

25. The data transmitting method as claimed in claim 16, wherein the data packet is transmitted by a real-time transport protocol.

26. A data receiving system, comprising:

a data communicator receiving a data packet, and transmitting retransmission control information of a received error-occurring data packet; and
a retransmission controller determining a packet number and identifier information of the received error-occurring data packet, the identifier information containing information about a kind of data, a sequence of data, and/or a packet generating sequence, generating the retransmission control information according to the determined packet number and the identi-

fier information, and outputting the retransmission control information.

**27.** The data receiving system as claimed in claim 26, wherein the retransmission controller comprises:

an identifier identifying the packet number of the received error-occurring data packet;
an identifier information determiner determining the identifier information of the received error-occurring data packet; and
a retransmission control information generator generating the retransmission control information.

**28.** The data receiving system as claimed in claim 26, wherein the retransmission control information comprises a packet number of the received error-occurring data packet, and a number of retransmission times.

**29.** The data receiving system as claimed in claim 26, wherein the retransmission control information comprises a packet number of the received error-occurring data packet, and a retransmission priority.

**30.** The data receiving system as claimed in claim 26, wherein the retransmission control information is transmitted by a real-time transport control protocol.

**31.** A data receiving method, comprising

identifying a packet number of a received error-occurring data packet;
determining identifier information of the received error-occurring data packet, the identifier information containing information about a kind of data, a sequence of data, and/or a packet generating sequence;
generating retransmission control information based on the determined packet number and the identifier information; and
transmitting the generated retransmission control information.

**32.** The data receiving method as claimed in claim 31, wherein the retransmission control information comprises a packet number of the received error-occurring data packet, and a number of retransmission times.

**33.** The data receiving method as claimed in claim 31, wherein the retransmission control information comprises a packet number of the received error-occurring data packet, and a retransmission priority.

**34.** The data receiving method as claimed in claim 31, wherein the retransmission control information is transmitted by a real-time transport control protocol.

**35.** A data transmitting/receiving system, comprising:

a data transmitter transmitting a data packet containing identifier information according to a kind of data, a sequence of data, and/or a packet generating sequence; and
a data receiver receiving the data packet, determining a packet number and the identifier information of a received error-occurring data packet, generating retransmission control information according to the determined packet number and the identifier information, and outputting the retransmission control information.

**36.** The data transmitting/receiving system as claimed in claim 35, wherein the data transmitter, comprises:

a packet generator generating the data packet containing the identifier information according to the kind of the data, the sequence of the data, and/or the packet generating sequence;
a packet transmitter transmitting the data packet containing the identifier information;
a receiver receiving the retransmission control information of the received error-occurring data packet; and
a retransmitter retransmitting the received error-occurring data packet according to the retransmission control information.

**37.** The data transmitting/receiving system as claimed in claim 36, wherein the packet generator adds the identifier information to a header of the data packet.

**38.** The data transmitting/receiving system as claimed in claim 36, wherein the data is any one of intra image and inter image.

**39.** The data transmitting/receiving system as claimed in claim 38, wherein the packet generator adds the identifier information to the intra image, the identifier information having a higher priority for the intra image than a priority of the inter image.

**40.** The data transmitting/receiving system as claimed in claim 36, wherein the retransmission control information comprises a)packet number of the received error-occurring data packet, and a number of retransmission times.

**41.** The data transmitting/receiving system as claimed in claim 40, wherein the retransmitter retransmits a data packet corresponding to the packet number according to the number of retransmission times set for the packet number.

**42.** The data transmitting/receiving system as claimed in claim 36, wherein the retransmission control information comprises a packet number of the received error-occurring data packet, and a retransmission priority.

**43.** The data transmitting/receiving system as claimed in claim 42, wherein the retransmitter retransmits a data packet corresponding to the packet number according to the retransmission priority set for each data packet.

**44.** The data transmitting/receiving system as claimed in claim 35, wherein the data receiver, comprises:

a data communicator receiving the data packet, and transmitting the retransmission control information of the received error-occurring data packet; and
a retransmission controller determining the packet number and the identifier information of the received error-occurring data packet, generating the retransmission control information according to the determined packet number and the identifier information, and outputting the retransmission control information.

**45.** The data transmitting/receiving system as claimed in claim 44, wherein the retransmission controller, comprises:

an identifier identifying the packet number of the received error-occurring data packet ;
an identifier information determiner determining the identifier information of the received error-occurring data packet; and
a retransmission control information generator generating the retransmission control information based on the determined packet number and the identifier information.

**46.** The data transmitting/receiving system as claimed in claim 44, wherein the retransmission control information comprises a packet number of the received error-occurring data packet, and a number of retransmission times.

**47.** The data transmitting/receiving system as claimed in claim 44, wherein the retransmission control information comprises a packet number of the received error-occurring data packet, and a retransmission priority.

**48.** The data transmitting/receiving system as claimed in claim 44, wherein the retransmission control information is transmitted by a real-time transport control protocol.

**49.** A data transmitting/receiving method, comprising

generating and transmitting a data packet containing identifier information according to a kind of data, a sequence of data, and/or a packet generating sequence; and
receiving the data packet, determining a packet number and the identifier information of the received error-occurring data packet, generating retransmission control information according to the determined packet number and the identifier information, and outputting the retransmission control information.

**50.** The data transmitting/receiving method as claimed in claim 49, wherein the identifier information is added to a header of the data packet.

**51.** The data transmitting/receiving method as claimed in claim 49, wherein the data is any one of intra image and inter image.

**52.** The data transmitting/receiving method as claimed in claim 51, wherein the packet is generated by adding the identifier information to the intra image, the identifier information having a higher priority for the intra image than a priority of the inter image.

**53.** The data transmitting/receiving method as claimed in claim 49, wherein the data packet is transmitted by a real-time transport protocol.

**54.** The data transmitting/receiving method as claimed in claim 43, wherein outputting of the retransmitting control information comprises:

identifying a packet number of the received error-occurring data packet;
determining the identifier information of the received error-occurring data packet;
generating the retransmission control information based on the determined packet number and the identifier information; and
transmitting the generated retransmission control information.

**55.** The data transmitting/receiving method as claimed in claim 49, wherein the retransmission control information comprises a packet number of the received error-occurring data packet, and a number of retransmission times.

**56.** The data transmitting/receiving method as claimed in claim 54, further comprising retransmitting a data packet, in response to a retransmission request, according to the retransmission times set for the packet number.

**57.** The data transmitting/receiving method as claimed in claim 49, wherein the retransmission control information comprises a packet number of the received error-occurring data packet, and a retransmission priority.

**58.** The data transmitting/receiving method as claimed in claim 57, further comprising retransmitting a data packet, in response to a retransmission request, according to the retransmission priority set for each data packet.

**59.** The data transmitting/receiving method as claimed in claim 49, wherein the retransmission control information is transmitted by a real-time transport control protocol.

**60.** A data transmitting/receiving system transmitting/receiving streaming multimedia data over a network, comprising:

a transmitter comprising a programmed computer processor detecting frame types of the multimedia data, generating identifying information based upon the frame types, generating RTP data packets containing the identifying information, transmitting the generated RTP data packets and retransmitting lost and/or damaged RTP data packets according to received retransmission control information; and
a receiver comprising a programmed computer processor receiving the generated RTP data packets, generating retransmission control information based upon the identifier information in the received RTP data packets upon the loss of and/or damage to the RTP data packets, transmitting the retransmission control information to the transmitter, and receiving the retransmitted lost and/or damaged RTP data packets.

**61.** The data transmitting/receiving system of claim 60, wherein the processor further generates as the identifier information a packet generating sequence corresponding to divided frames transmitted in the RTP data packets.

**62.** The data transmitting/receiving system of claim 60, wherein the multimedia data is encoded according to MPEG standard.

**63.** A method of streaming multimedia data over a network, comprising:

controlling RTP data packet retransmissions upon lost and/or damaged data packets according to streaming-restoration characteristics of the multimedia data.

FIG.1

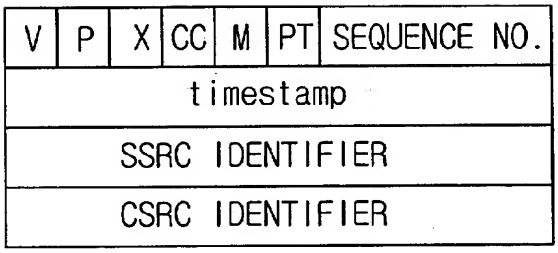



FIG.2

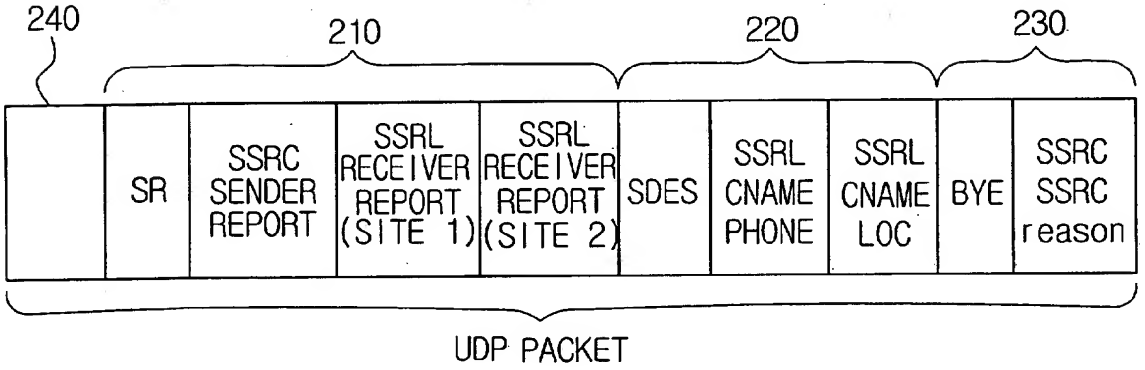



FIG.3

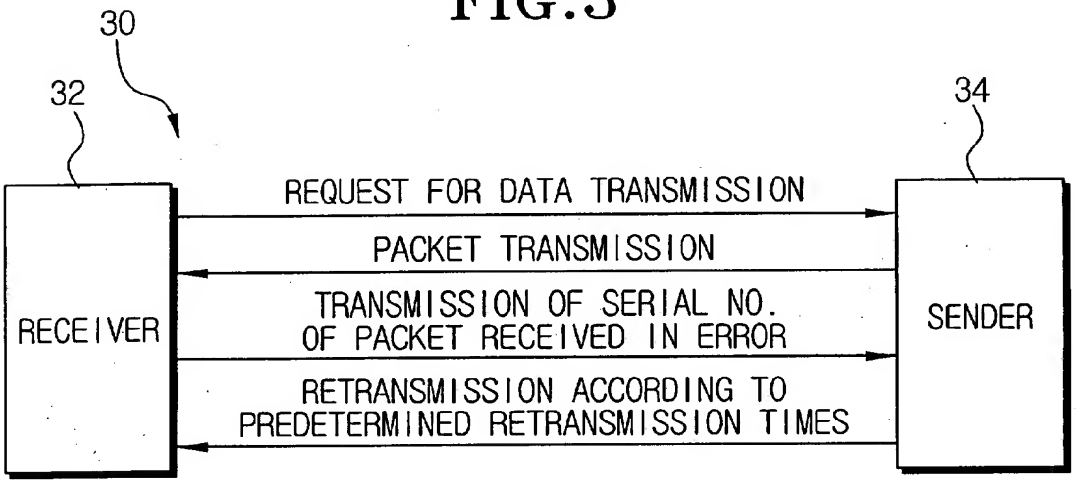


FIG.4

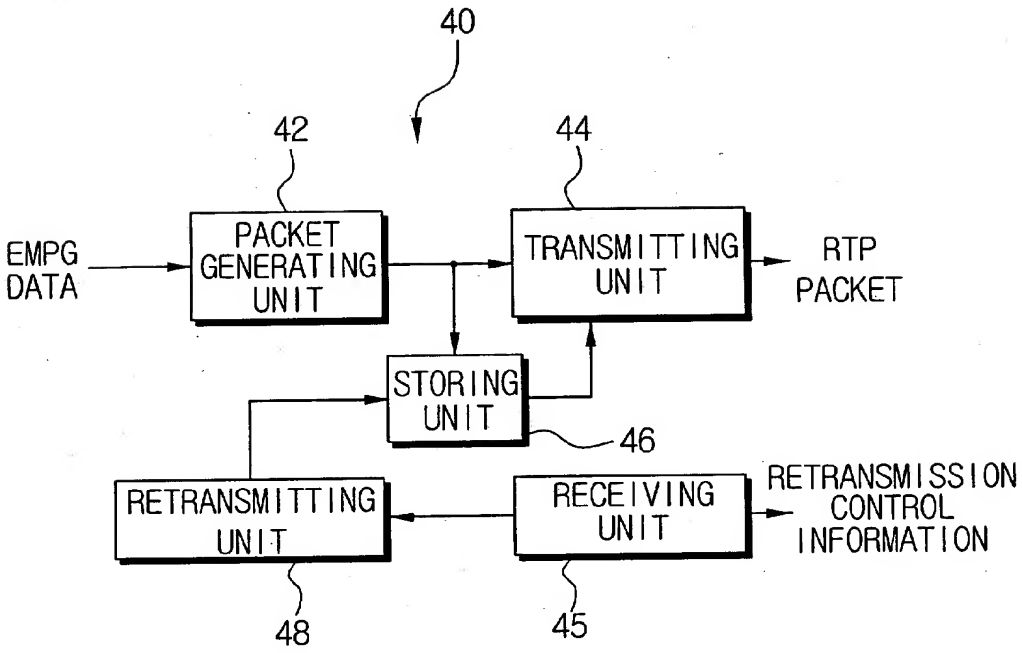

40
42
44
EMPG DATA
PACKET GENERATING UNIT
TRANSMITTING UNIT
RTP PACKET
STORING UNIT
46
RETRANSMITTING UNIT
RECEIVING UNIT
RETRANSMISSION CONTROL INFORMATION
48
45

FIG.5

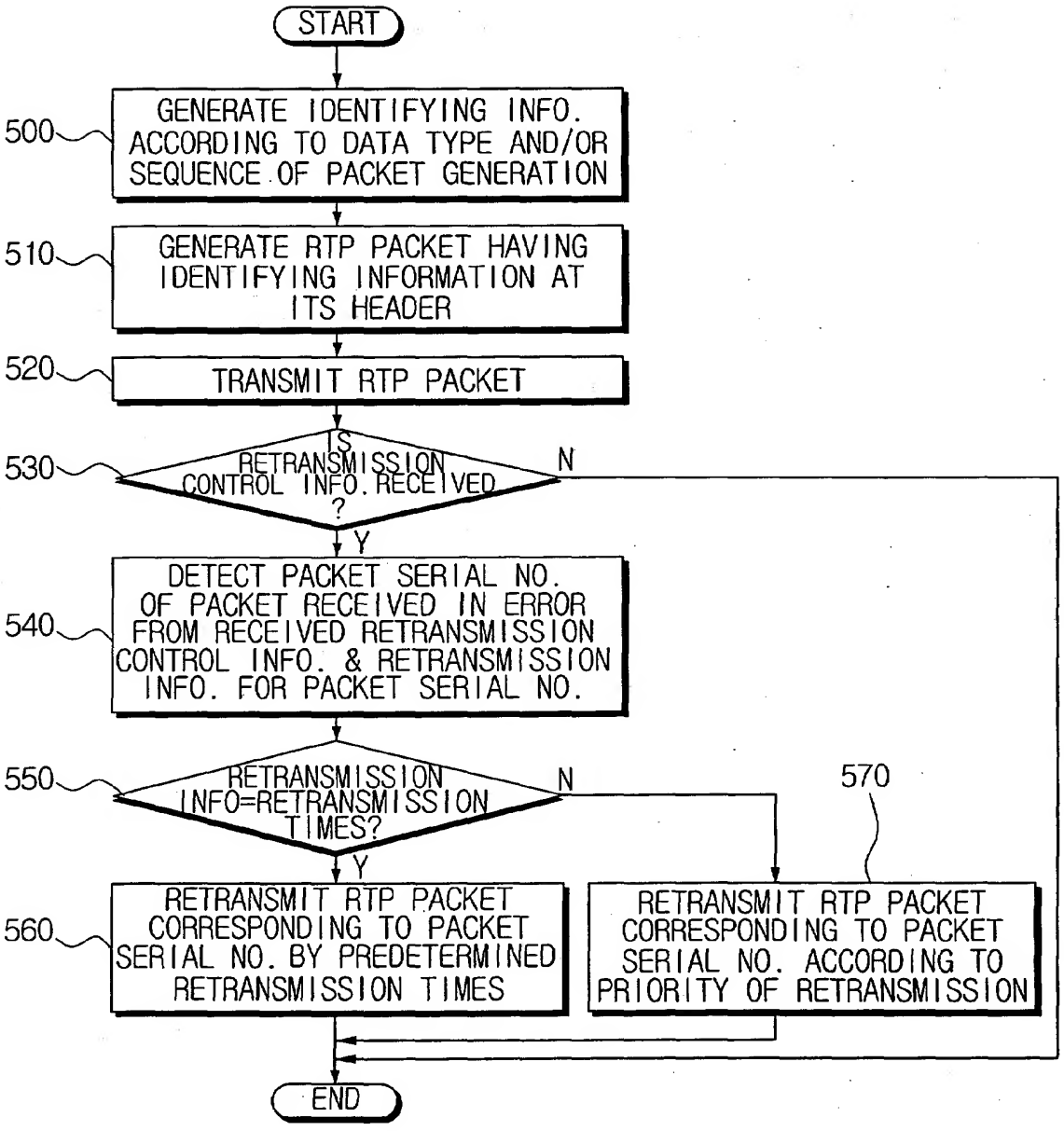

START
500
GENERATE IDENTIFYING INFO. ACCORDING TO DATA TYPE AND/OR SEQUENCE OF PACKET GENERATION
510
GENERATE RTP PACKET HAVING IDENTIFYING INFORMATION AT ITS HEADER
520
TRANSMIT RTP PACKET
530
IS RETRANSMISSION CONTROL INFO. RECEIVED ?
N
Y
540
DETECT PACKET SERIAL NO. OF PACKET RECEIVED IN ERROR FROM RECEIVED RETRANSMISSION CONTROL INFO. & RETRANSMISSION INFO. FOR PACKET SERIAL NO.
550
RETRANSMISSION INFO=RETRANSMISSION TIMES?
N
Y
570
560
RETRANSMIT RTP PACKET CORRESPONDING TO PACKET SERIAL NO. BY PREDETERMINED RETRANSMISSION TIMES
RETRANSMIT RTP PACKET CORRESPONDING TO PACKET SERIAL NO. ACCORDING TO PRIORITY OF RETRANSMISSION
END

FIG.6

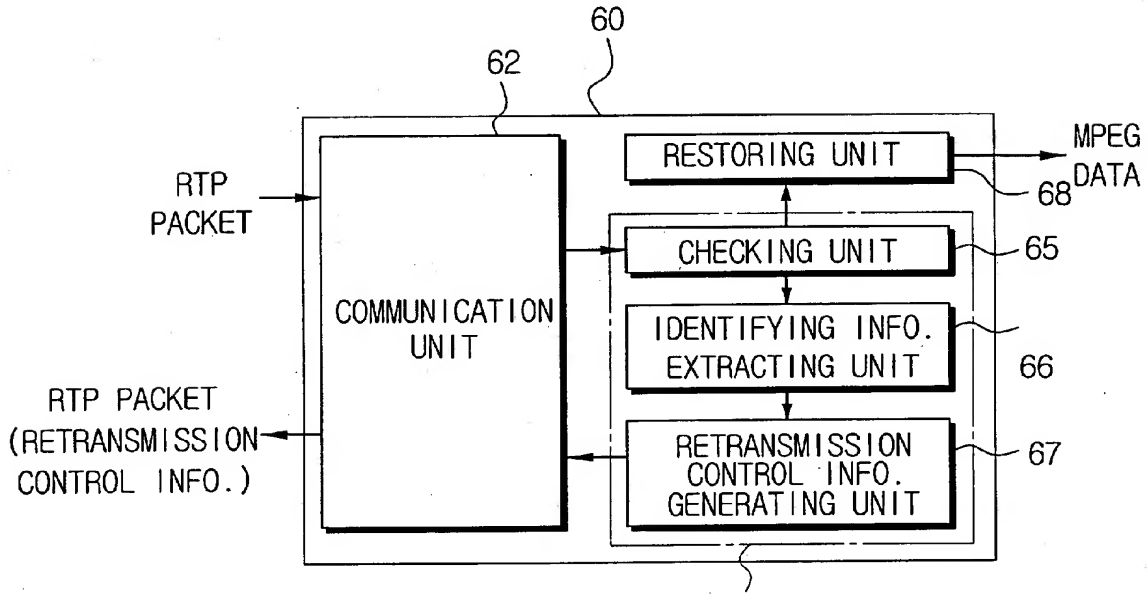

60
62
RTP PACKET
COMMUNICATION UNIT
RTP PACKET (RETRANSMISSION CONTROL INFO.)
RESTORING UNIT
MPEG DATA
68
CHECKING UNIT
65
IDENTIFYING INFO. EXTRACTING UNIT
66
RETRANSMISSION CONTROL INFO. GENERATING UNIT
67

FIG.7

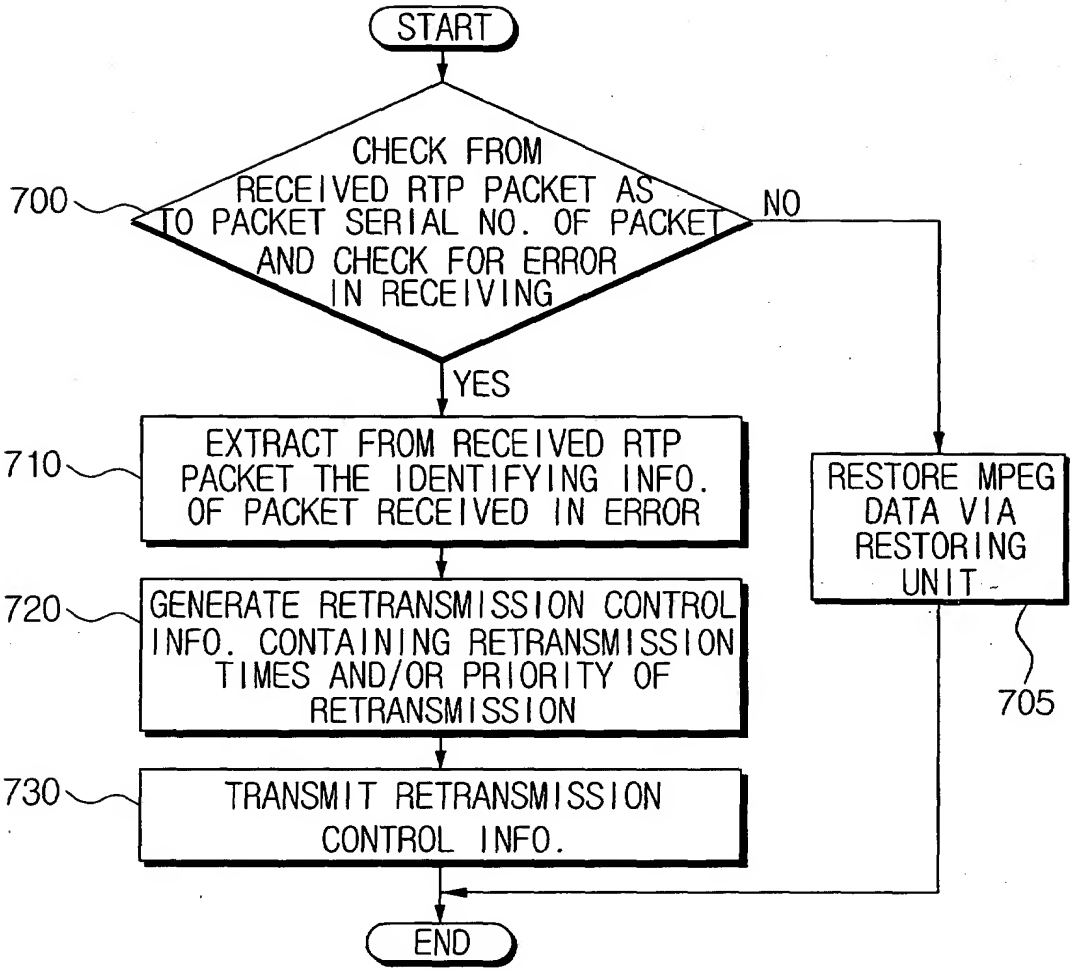

START
CHECK FROM RECEIVED RTP PACKET AS TO PACKET SERIAL NO. OF PACKET AND CHECK FOR ERROR IN RECEIVING
700
NO
YES
EXTRACT FROM RECEIVED RTP PACKET THE IDENTIFYING INFO. OF PACKET RECEIVED IN ERROR
710
GENERATE RETRANSMISSION CONTROL INFO. CONTAINING RETRANSMISSION TIMES AND/OR PRIORITY OF RETRANSMISSION
720
TRANSMIT RETRANSMISSION CONTROL INFO.
730
RESTORE MPEG DATA VIA RESTORING UNIT
705
END

FIG.8

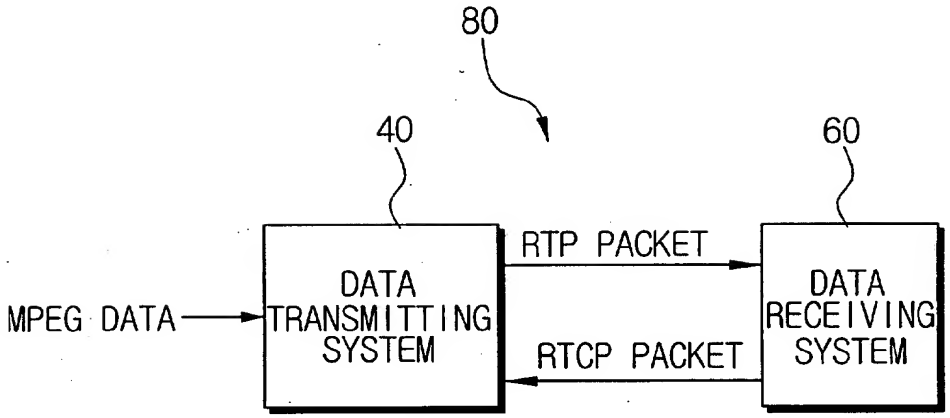
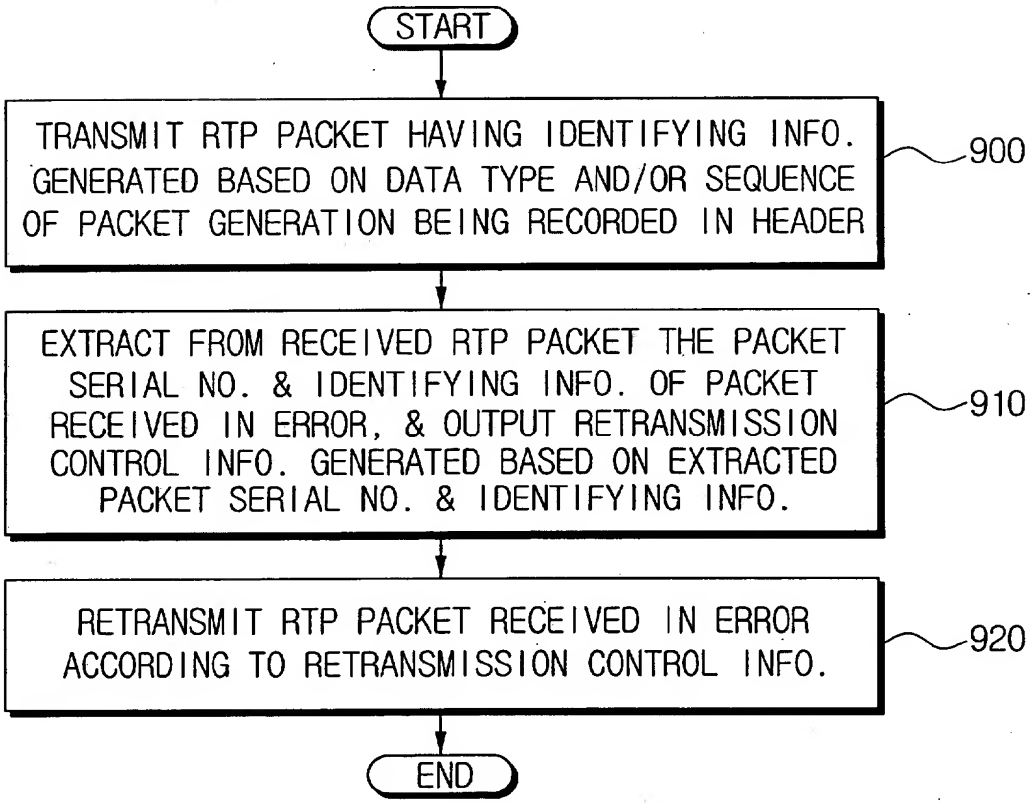

80
40
60
MPEG DATA
DATA TRANSMITTING SYSTEM
RTP PACKET
RTCP PACKET
DATA RECEIVING SYSTEM

FIG.9


START
TRANSMIT RTP PACKET HAVING IDENTIFYING INFO. GENERATED BASED ON DATA TYPE AND/OR SEQUENCE OF PACKET GENERATION BEING RECORDED IN HEADER
900
EXTRACT FROM RECEIVED RTP PACKET THE PACKET SERIAL NO. & IDENTIFYING INFO. OF PACKET RECEIVED IN ERROR, & OUTPUT RETRANSMISSION CONTROL INFO. GENERATED BASED ON EXTRACTED PACKET SERIAL NO. & IDENTIFYING INFO.
910
RETRANSMIT RTP PACKET RECEIVED IN ERROR ACCORDING TO RETRANSMISSION CONTROL INFO.
920
END

**PUB-NO:** EP001328096A2

**DOCUMENT-IDENTIFIER:** EP 1328096 A2

**TITLE:** Multimedia data packet communication with data type identifiers

**PUBN-DATE:** July 16, 2003

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**APPL-NO:** EP03250136

**APPL-DATE:** January 9, 2003

**PRIORITY-DATA:** KR20020001563A (January 10, 2002)

**INT-CL (IPC):** H04L012/56 , H04L029/06

**EUR-CL (EPC):** H04L001/16 , H04L001/18 , H04L012/56 , H04L029/06 , H04L029/06

**ABSTRACT:**

CHG DATE=20071116 STATUS=C>A data transmitter (40) comprises means (42, 44) for transmitting a data packet containing identifier information comprising a kind of data, a sequence of data, and/or a packet generating sequence. A receiver (60) includes means (66) for extracting a packet number and the identifier information for an error-receipt occurring data packet based upon the identifier information recorded in a header of the packet, means (67) for generating retransmission control information, such as retransmission times and priority, based on the extracted packet number and the identifier information and transmitting the retransmission control information to the transmitter of the packet. The retransmission of the error-occurring data packets is in accordance with the retransmission control information received by the data transmitter (40). The number of retransmissions and the retransmission priority can be varied according to characteristics of the transmitted data, so that retransmissions is suitable for the characteristics of the data and to more stably receive the data that is more influential to the restoration of the data.